

Appl. No. 09/447,301
Amdt. Dated March 9, 2007
Reply to Office Action of January 9, 2007

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AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) A solid-state image-pickup device having:

a sensor array comprising a plurality of sensors; and

~~a plurality of a first and second transfer registers~~ register for transferring signal charges ~~from generated in~~ in said sensors of said sensor array,

at least ~~one horizontal~~ horizontal ~~a third~~ transfer register is formed between said first ~~transfer registers~~ register and said second transfer register for storing temporarily and transferring said signal charges from said first transfer register to said second transfer register;

wherein a read-out gate is provided between the sensor array and an accumulation gate for reading-out charges generated in the sensor array to the accumulation gate as a function of an applied read-out gate control signal, the an accumulation gate is provided between the read-out gate and said first transfer register ~~transfer registers for accumulating said signal charges and allocating said signal charges to said transfer registers and further wherein said plurality of transfer registers include two transfer registers which receive and concurrently transfer said signal charges from at least two rows of pixels of said sensor array.~~
2. (Canceled)

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3. (Previously Presented) A solid-state image-pickup device according to claim 1, wherein said accumulation gate creates a difference in electric potential oriented in a direction of transfer.

4. (Previously Presented) A solid-state image-pickup device according to claim 1 wherein signal charges of said sensors are stored in said accumulation gate to be allocated in units of electrical charge each originated by one of said sensors.

5. (Previously Presented) A solid-state image-pickup device according to claim 1 wherein signal charges of said sensors are allocated to respective transfer registers for each odd sensor and each even sensor of said sensor array.

6. (Currently Amended) A method of driving a solid-state image-pickup device having:

a sensor array comprising a plurality of sensors;

~~a plurality of~~ first and second transfer registers for transferring signal charges ~~from~~ generated in said sensors of said sensor array;

at least ~~one horizontal~~ horizontal a third transfer register formed between said first transfer registers register and said second transfer register for storing temporarily and transferring said signal charges from said first transfer register to said second transfer register;

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a read-out gate ~~are~~ is provided between the sensor array and an accumulation gate for reading-out charges generated in the sensor array to the accumulation gate as a function of an applied read-out gate control signal, the accumulation gate is provided between said read-out gate and said first transfer register registers,

said method comprising the steps of:

reading out signal charges ~~from all of~~ generated in said sensors in a row closest to said accumulation gate at a same time via the read-out gate;

allocating said signal charges of said sensors from said accumulation gate to said ~~transfer registers~~ first transfer register; and

driving said ~~transfer registers~~ first and second transfer registers to output said signal charges and ~~further wherein said plurality of transfer registers include two transfer registers which receive and concurrently transfer said signal charges from at least two rows of pixels of said sensor array.~~

7. (Currently Amended) A method of driving a solid-state image-pickup device according to claim 6 whereby said transfer registers are driven at the same time and in the same direction.

8. (Previously Presented) A method of driving a solid-state image-pickup device according to claim 6 whereby signal charges of said sensors are allocated to respective transfer registers for each odd sensor and each even sensor of said sensor array.

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9. (Previously Presented) The solid-state image-pickup device according to claim 1, wherein said horizontal-horizontal transfer register has a same number of columns as said transfer registers.

10. (Previously Presented) The method of driving a solid-state image-pickup device according to claim 6, wherein said horizontal-horizontal transfer register has a same number of columns as said transfer registers.

11. (Previously Presented) The solid-state image-pickup device according to claim 2, said accumulation gate and said read-out gate share a common gate electrode.

12. (Previously Presented) The method of driving a solid-state image-pickup device according to claim 6, wherein said step of reading out and said step of allocating are carried out through a common gate electrode.

13. (Currently Amended) A solid-state image-pickup device having:
a sensor array comprising a plurality of sensors; and
~~a plurality of transfer registers~~ first and second transfer registers for transferring signal charges ~~from generated in~~ said sensors of said sensor array,

at least ~~one horizontal-horizontal~~ a third transfer register is formed between said ~~transfer registers~~ first transfer register and said second transfer register for storing temporarily

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and transferring said signal charges from said first transfer register to said second transfer register;

wherein a read-out gate is provided between the sensor array and an accumulation gate for reading-out charges generated in the sensor array to the accumulation gate as a function of an applied read-out gate control signal, the accumulation gate is provided between the read-out gate and said first transfer register ~~transfer registers for reading out signal charges from said sensors at a same time, accumulating said signal charges and allocating said signal charges to said transfer registers~~, the accumulation gate being directly connected to the sensor array via a the readout gate without any vertical transfer registers between the sensor array and the accumulation gate ~~and further wherein said plurality of transfer registers include two transfer registers which receive and concurrently transfer said signal charges from at least two rows of pixels of said sensor array.~~

14. (Currently Amended) A method of driving a solid-state image-pickup device having:

a sensor array comprising a plurality of sensors;

~~a plurality of transfer registers~~ first and second transfer registers for transferring signal charges ~~from~~ generated in said sensors of said sensor array;

~~at least one horizontal horizontal~~ a third transfer register formed between said transfer registers first and second transfer registers for storing temporarily and transferring said signal charges from said first transfer register to said second transfer register;

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a read-out gate provided between the sensor array and an accumulation gate for reading-out charges generated in the sensor array to the accumulation gate as a function of an applied read-out gate control signal, the accumulation gate provided between said read-out gate and said first transfer register ~~transfer registers~~, the accumulation gate being directly connected to the sensor array via the readout gate without any vertical transfer registers between the sensor array and the accumulation gate;

said method comprising the steps of:

reading out signal charges ~~from all of~~ generated in said sensors in a row closest to said accumulation gate at a same time via the read-out gate;

allocating said signal charges of said sensors from said accumulation gate to said ~~transfer registers~~ first transfer register; and

driving said first and second transfer registers to output said signal charges ~~and further wherein said plurality of transfer registers include two transfer registers which receive and concurrently transfer said signal charges from at least two rows of pixels of said sensor array.~~

15. (Previously Presented) The solid-state image-pickup device according to claim 1, wherein the read-out gate and the accumulation gate are comprised of a same material.

16. (Previously Presented) The solid-state image-pickup device according to claim 13, wherein the read-out gate and the accumulation gate are comprised of a same material.

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17. (Previously Presented) The solid-state image-pickup device according to claim 1, wherein the read-out gate transmits all received signals from the sensor array to the accumulation gate and the accumulation gate subsequently transfers all of the signals to the transfer registers.

18. (Currently Amended) The solid-state image-pickup device according to claim 13, wherein the read-out gate transmits all received signals from the sensor array to the accumulation gate and the accumulation gate subsequently transfers all of the signals to the transfer registers.

Please add the following new claims:

19. (New) The solid-state image-pickup device according to claim 1, further wherein said plurality of transfer registers include two transfer registers, each of which receives and concurrently transfers signal charges derived from a single row of pixels of said sensor array, and wherein the first of the two transfer registers transfers signal charges from a different row than the second of the two transfer registers.

20. (New) The solid-state image-pickup device according to claim 13, further wherein said plurality of transfer registers include two transfer registers, each of which receives and concurrently transfers signal charges derived from a single row of pixels of said sensor array, and wherein the first of the two transfer registers transfers signal charges from a different row than the second of the two transfer registers.

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21. (New) The solid-state image-pickup device according to claim 1, further wherein said plurality of transfer registers include at least four transfer registers, each of which receives and concurrently transfers signal charges derived from one of at least two rows of pixels of said sensor array, and wherein a first and second of the four transfer registers transfers signal charges from a different row than a third and fourth of the four transfer registers.

22. (New) The solid-state image-pickup device according to claim 13, further wherein said plurality of transfer registers include at least four transfer registers, each of which receives and concurrently transfers signal charges derived from one of at least two rows of pixels of said sensor array, and wherein a first and second of the four transfer registers transfers signal charges from a different row than a third and fourth of the four transfer registers.

23. (New) The solid-state image-pickup device according to claim 1, further wherein said plurality of transfer registers include at least six transfer registers, each of which receives and concurrently transfers signal charges derived from one of at least three rows of pixels of said sensor array, and wherein a first and second of the six transfer registers transfers signal charges from a different row than a third and fourth of the six transfer registers, and a fifth and sixth of the six transfer registers transfers signal charges from a different row than either one of the first through fourth transfer registers.

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24. (New) The solid-state image-pickup device according to claim 13, further wherein said plurality of transfer registers include at least six transfer registers, each of which receives and concurrently transfers signal charges derived from one of at least three rows of pixels of said sensor array, and wherein a first and second of the six transfer registers transfers signal charges from a different row than a third and fourth of the six transfer registers, and a fifth and sixth of the six transfer registers transfers signal charges from a different row than either one of the first through fourth transfer registers.